STATEMENT OF WORK
for
Developing a Monitoring Plan for Aquatic Ecosystems in the Northern Great Plains Network

Introduction

The Northern Great Plains Inventory & Monitoring Network (Network) of the National Park Service (NPS) consists of 13 NPS units in North and South Dakota, Nebraska, and eastern Wyoming. The Network is in the planning phase of a long-term program to monitor the health of park ecosystems. Over the next two-three years the Network will develop a "Vital Signs"[1] Monitoring Plan (Plan). The Plan will provide background information on park aquatic resources, stressors to those resources, current monitoring efforts, a list of potential indicators and the reasons for choosing such indicators, the protocols to be used in monitoring, threshold or trigger levels, and potential management responses. Dr. Nels Troelstrup of South Dakota State University (SDSU) has agreed to develop the aquatics portion of the Plan. This Statement of Work (SOW) documents the respective roles of SDSU and NPS in developing the aquatics portion of the Plan, the deliverables and timelines involved, and the project budget.

Background

In 1998 Congress directed the NPS to conduct baseline natural resource inventories and to implement a long-term monitoring program in national park units (National Parks Omnibus Management Act of 1998). Congress' intent was for the agency to monitor the ecological "health" of the parks. To implement the initiative, the NPS delineated 32 networks of parks, one of which is the Northern Great Plains Network (see http://www.nature.nps.gov/im/monitor/networks/networks.htm for more information on the national NPS Inventory & Monitoring Program). The park units in the Network are:

Parks of the Northern Great Plains Network

Parks (and their administrative alpha codes)	Acres
Agate Fossil Beds National Monument (AGFO)	3,055
Badlands National Park (BADL)	244,300
Devils Tower National Monument (DETO)	1,360
Fort Laramie National Historic Site (FOLA)	833
Fort Union Trading Post National Historic Site (FOUS)	450
Jewel Cave National Monument (JECA)	1,355
Knife River Indian Villages National Historic Site (KNRI)	1,758
Missouri National Recreation River (MNRR)	33,839
Mount Rushmore National Memorial (MORU)	1,238
Niobrara National Scenic River (NIOB)	21,035
Scotts Bluff National Memorial (SCBL)	3,003
Theodore Roosevelt National Park (THRO)	70,446
Wind Cave National Park (WICA)	28,295

[1] "Vital Signs" is a phrase used by the NPS to describe the agency's monitoring program. Vital Signs are synonymous with ecological indicators. These indicators can be biotic or abiotic. They are measureable and tend to be correlated with, or indicative of, the overall health of a wide group of resources.

The Network is midway through conducting baseline natural resource inventories. Network field projects have focused on vertebrates and vascular plants. Detailed information on these field inventories can be found in the Network's inventory study plan (National Park Service 2002). Abiotic inventories have been administered at the national level. Information on the national inventory program can be found at http://www1.nature.nps.gov/im/inventory/index.htm .

In fiscal year 2003 the Network received $150,000 in startup funds for the monitoring phase of the Inventory & Monitoring (I&M) Program. The startup money is intended to fund a Network I&M Coordinator (Network Coordinator) and Network Data Manager and to begin development of a "Vital Signs" monitoring plan. It is anticipated that the Network will receive $250,000 in fiscal year 2004 for continued development of the plan. In fiscal year 2005 the Network should receive full monitoring funding (approximately $800,000) and begin the process of hiring monitoring staff. Implementation of the Plan may begin as early as 2005, although full implementation will likely not occur until 2006. Development of a comprehensive and defensible "Vital Signs" monitoring plan is the Network's highest priority at this time. The Network selected Dr. Troelstrup to assist in completing the aquatic portion of the Plan.

Goals and Objectives

The **goal of this project is to develop the aquatic portion of the Network's "Vital Signs" monitoring plan by March 30, 2006**. The following objectives need to be met for successful completion of the project. These objectives constitute the primary project deliverables.

- Provide a detailed review, synthesis, and assessment of park aquatic resources, park goals and objectives in regards to those resources, and authorities and policies affecting those resources and park management.
- Conduct a baseline aquatic inventory of park resources using methods and protocols that provide for a rapid assessment of the health of aquatic resources in the park. The inventory should contribute to the park's knowledge of flora and fauna.
- Provide a detailed review, synthesis, and assessment of aquatic monitoring efforts being conducted by NPS and non-NPS entities in and around Network parks.
- Provide a detailed review, synthesis, and assessment of past, present, and potential future factors (i.e., stressors) affecting park aquatic resources.
- Develop conceptual aquatic ecosystem models which show the relationships between park resources, stressors, and management actions.
- Solicit input from park staff, other interested agencies and organizations, subject-matter experts, and experts knowledgeable in the theories, principles, and methods of monitoring aquatic resources.
- Conduct a decision-making process that ranks potential aquatic indicators and identifies those specific indicators that should be monitored.

- Develop monitoring protocols for selected aquatic indicators that is scientifically defensible and can be implemented within the logistical, fiscal, and administrative constraints of the I&M Program and Network parks.
- Identify normal limits of variation of selected indicators and thresholds which trigger management actions.
- Identify potential management actions in response to indicators reaching trigger points.
- Work closely with the Network Data Manager to develop GIS databases, aquatic tabular databases, statistical analyses, and infrastructure needed to implement a monitoring program.
- Present all of this information in a coherent and complete document that can readily be integrated into a comprehensive monitoring plan following recommended NPS guidelines.

Approach and Methods

Dr. Troelstrup of SDSU will be the Principle Investigator (PI) on the project (also known as the Senior Scientist). Dr. Troelstrup will commit at least 10% of his time to the project over the life of the project. Dr. Troelstrup will oversee a Graduate Research Assistant (with an emphasis in aquatic ecology) dedicated to the project. The Graduate Research Assistant will have knowledge of aquatic resources with emphasis on Great Plains natural resources, or the ability to quickly develop the knowledge. The Graduate Research Assistant will work fulltime on the project during the summer and part time during the school year. Two additional people will be hired part-time to assist with the project. A GIS Specialist will be hired to assist in the collection, synthesis, and analysis of spatial data. This person could be brought on as a graduate student, or hired in some other capacity. The GIS Specialist is expected to work closely with the Network Data Manager to assure data collection and analysis meets NPS standards and needs. A general technician will be hired to assist in field work, laboratory analysis, data mining, and other needs.

The tasks and approach required can be separated into three components. They are (generally in chronological order):

Task 1: Collect, review, and assess literature and other information related to park aquatic resources. Review and summarize programs and methods for aquatic monitoring being used by the states of North and South Dakota, Nebraska, and Wyoming. Review pertinent scientific literature (e.g., Berkman et al. 1986, Lenat and Barbour 1994, Norton et al. 2000), guidance documents (e.g., Coffney et al. 1993), and agency reports (e.g., Huggins and Moffett 1988, Rabeni et al. 1997, Donley et. al. 1999). Special emphasis should be placed on EPA and state water quality standards, classifications, and criteria (e.g., drinking water, recreation, aquatic life protection) by aquatic resource classes (wetlands, lakes, intermittent streams, cold-water streams). The latest version of the Water Quality Standards Handbook (EPA 1994) and Quality Criteria for Water (EPA 1986) and other federal water quality documents should be obtained and reviewed for appropriate standards and criteria as they relate to past, present, and potential future water

quality conditions associated with each park. The most current designated uses for the water bodies occurring within each park should be determined by review of the appropriate state and/or federal information applicable to the individual park. This review should include a list of which, if any, water bodies within individual parks have been placed on state 303(d) lists and the reason(s) for placement on such lists. As part of the data mining process the investigators should have a meeting at each park with park management and park natural resource specialists. Non-NPS water quality specialists shall be consulted as needed.

Task 2: Conduct a field survey and assessment of aquatic resources in each park. Such surveys and assessment should include a survey of macro-invertebrates and other organisms typically used in aquatic monitoring and assessment programs. Where possible and appropriate the field surveys should collect quantitative data in a scientifically defensible and replicable way. The field work should provide a preliminary snapshot of the health of the park's aquatic resources and provide valuable baseline information for development of the monitoring plan. The field work is expected to contribute to the park's species list.

Task 3: Using the information collected in Task 1 and Task 2, develop a complete list of potential indicators of aquatic health. Clearly describe and justify the potential indicators on the list, and describe some potential approaches to monitoring such indicators, and the potential implications to park management. From the complete list of potential indicators work with park staff, the Network Coordinator, and other subject-matter experts to identify and select a final list of indicators to be monitored at the individual parks. Such a list will need to reconcile park-specific needs and issues against the efficiency of a uniform Network approach. For the selected indicators design monitoring protocols including personnel and costs. For the selected indicators develop thresholds or exceedence levels that trigger management actions, and identify potential management actions. Present the information in a final report.

Required Meetings

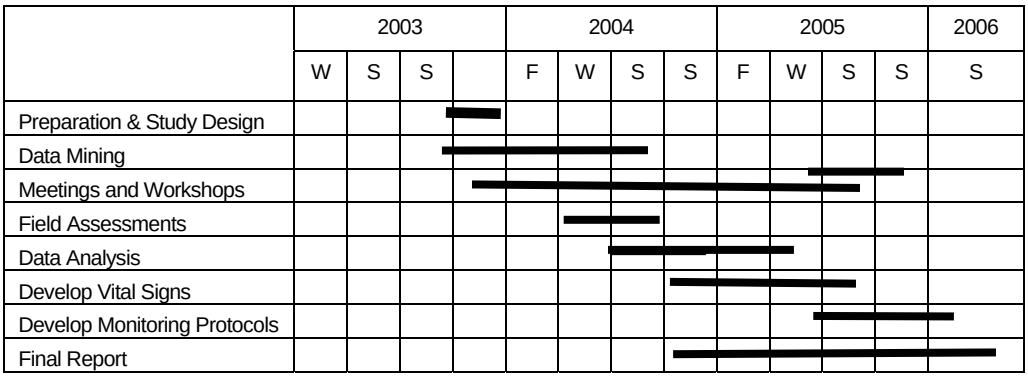
Facilitation and/or participation in the following meetings is necessary for completion of the project (this shall not be construed as a complete list of all meetings/travel that will occur).

- Conduct a half day meeting with management and natural resource staff from each park and a half day field visit of the park (i.e., one day at each park). The PI should attend as many of these meetings as possible.
- Participate in Network-wide workshops. One such meeting will include interested stakeholders and subject-matter experts. Another such meeting will include only NPS staff. Other meetings may be required.
- Give a 2-hour presentation on the status of the project at the annual I&M meeting held in Rapid City each winter (typically in January-February).

- Attend a national NPS meeting on monitoring at least once (anticipated to be held annually). If location of the meeting dictates air travel the cost will be reimbursed by the Network outside of the CESU agreement.

Work Schedule

The following schedule is presented as guidance. Deviations from this guidance may occur in consultation with the Network Coordinator.



Participation and Services Provided by NPS

Projects funded through a CESU need substantial federal involvement (see **http://greatplains.cesu.unl.edu/project_planning.htm**). This project is designed to satisfy that requirement. The project is a collaborative effort between SDSU and the NPS, with both contributing to the final products. Indeed, substantial NPS involvement is critical to the success of this project. Specific examples of NPS involvement in this project include:

- The Network Coordinator will play an active role in all aspects of this project. The Network Coordinator will be in regular contact with the PI and their staff working on the project. The Network Coordinator will attend most meetings and workshops regarding this project. The Network Coordinator has ultimate responsibility and oversight for the project.
- The Network Data Manager will be the repository for data collected as part of this project. The Network Data Manager will assist the PI and their staff whenever possible in data management, database design, and data analysis. The Network Data Manager will provide support and assistance in the use of spatial data (i.e., GIS).
- Staff from Network parks will provide significant input into the collection of background data, significant issues, assessment of the park's resources, and stressors on those resources. Park staff will ultimately be responsible for identifying which indicators will be monitored. Park staff will review all critical documents for accuracy, clarity, and consistency with park operations.
- The Network Coordinator and his or her staff will provide substantial background data. This data includes vegetation maps, park species list, GIS layers, planning documents, copies of studies conducted, examples of monitoring plans from other

NPS networks, tools used by other NPS networks to prioritize indicators, monitoring guidance, and other materials. The PI is encouraged to used existing text from NPS documents whenever appropriate.

- The NPS Great Plains Cooperative Ecosystems Studies Unit (CESU) representative will review project proposals and other documents for substantiality in character and design. The NPS Midwest Region Inventory & Monitoring Coordinator will do likewise.
- The NPS Water Resources Division (WRD) will play an active role in the project by sharing data and information in their possession, providing technical and expert advice, and reviewing the project deliverables.
- The Network will administer and fund all travel expenses not incurred by the PI or people working on his/her behalf (e.g., for attendance to meetings by subject-matter experts).

Products

All products need to be delivered to the Network Coordinator. Deliverables in a digital format shall be in Microsoft Word, Excel, or Access formats (versions 97 or later), ESRI ArcView compatible formats, or TIFF image files. The PI shall consult with the Network Coordinator on other digital formats. Deliverables for this project include:

- Four hard copies of the final aquatic monitoring report (i.e., plan) and an electronic copy of such report. The final report shall be in a format suitable for integration into a comprehensive monitoring plan following the guidance of the Network Coordinator and the national NPS Inventory & Monitoring Program.
- Annual progress reports in digital format. Such reports are due by December 31 of each year. Such reports should highlight work conducted during the year and work planned for the subsequent year.
- Copies of all hard and electronic data collected, developed, and used as part of the project (excepting those items received from the NPS). This includes copies of reports, databases, and other information collected from the scientific literature, other agencies and organizations, and elsewhere, and those items created as part of the project (e.g., databases, meeting flipcharts, field notebooks, multi-media presentations). (Although project data belongs to NPS, SDSU is encouraged to use the data to conduct analyses, make inferences and conclusions, and publish the results thereof in scientific and other publications.)

Budget

This project will be funded through a CESU, as a modification to the CESU agreement between the NPS and SDSU. As required by the CESU arrangement, overhead and indirect costs are capped at 15%.

The majority of the expenses incurred by this project are in the form of personnel costs, specifically, for the PI, the Student, and the GIS and field technician assistants. Equipment and supplies expenditures are expected to generally be limited to inexpensive

computer items, field sampling equipment, and routine office materials. Major expenses such as satellite imagery and expensive computer equipment will be purchased by the NPS as needed and in consultation between the Network Coordinator and the PI. All travel is anticipated to be by vehicle, with the majority of the travel costs occurring in fiscal year 2004. Should airline travel be necessary the Network will reimburse those costs directly. The Network Coordinator and PI will consult on other unforeseen costs associated with the project.

Although not quantifiable, it is expected that the NPS involvement in the project in terms of in-kind contributions and outright expenses will be significant, perhaps equaling or exceeding the amount funded to SDSU. This significant involvement by NPS is consistent with the spirit and intent of the CESU program, and critical to the success of the project.

Expense	**FY04**	**FY05**	**FY06**	**Total**
Senior Scientist	$7,500	$7,500	$2,500	$17,500
Graduate Assistant Ecology	14,500	15,000	7,500	37,000
GIS	8,000	8,000	4,000	20,000
Undergraduate Field Tech	6,720	3,360	0	10,080
Equipment/Supplies	5,000	1,000	500	6,500
Lap Top Computer	3,500	0	0	3,500
Vehicle Use – Suburban (0.52/0.55)	2,500	1,250	250	4,000
Professional Meeting Travel	800	800	0	1,600
Lodging/Per Diem	6,500	2,000	500	9,000
Sub-Total	55,020	38,910	15,250	109,180
Indirect Costs (@15%)	8,253	5,837	2,288	16,378
Total	**$63,273**	**$44,747**	**$17,538**	**$125,558**

Literature

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